MCST L1B QA

MODIS Science Team Meeting, Nov 1999

MATERIAL DRAWN FROM PRESENTATION AT MAY SCIENCE TEAM MEETING

MORE DETAILS PRESENT IN MEETING NOTES ON WEB

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Summary

- Extensive Operational Activities and analysis to verify algorithm and look-up table values
- Each pixel has uncertainty (index) value associated with it
  - IR bands checked *each scan line*
  - Reflected solar bands checked *about weekly* from Solar Diffuser
- Each pixel that is uncalibratable is flagged
- QA in code run-time
- Algorithm upgrade and improvement validated through Workshop interactions

Level 1 QA/Validation

- QA and Validation nearly congruent
  - Primary basis for improved L1 algorithms and updates
- Phase I - Use of On-Board Calibrators (OBCs)
  - Extensive testing for first 90 days on-orbit operations
  - Spectral and spatial SRCA tests, lunar & deep space observations
  - On-Board Blackbody temperature cycles
  - Geolocation via Landsat “chips” and islands
  - Run-time QA parameter computation and reporting to MCST
  - OAs and CAs
- Phase II - Feedback from Science Data
  - Continued use of OBCs
  - Comparison with MODIS Level 2 products
  - Studies of non-MODIS radiance products
  - OAs, CAs and VAs

Radiometric, Characterization Validation Activities

	OA	CA	VA
RSB Reflectance/	9	1	1
Radiance	14	2	2
	18	3	3
	20	4	4
		7	5
		9	8
		10	11
		14	12
		17	13
		18	14
			16
			18
			19
TEB Radiance	10	9	6
	14	10	7
	17	15	9
	26	16	10
		17	14
			15
			17
			18
			19

RSB Stability and Spectral Spatial Validation Activities

	OA	CA	VA
RSB Response	8		19
Stability			
Spectral In-Band	22		
Spectral Out-		6	
of-band		15	
Spatial/PSFs	8	12	
		13	
Spatial IFOVs	23		
	24		
Spatial/Co-	23	12	
Registration	24		

Miscellaneous Validation Activities

	OA	CA	VA
OTHERS			
Transient Response		11	
		12	
		13	
LiB Space View		7	
Port LUT			
Residual Electrical	26		
Cross-talk			
Residual Optical	26	6	
Cross-talk/Ghosting		8	
		15	
Polarization			
Radiation Effects		5	

Summary of Validation Activities

(BRIEF DESCRIPTION AT MAY SCIENCE TEAM MTG NOTES)

Operational Activities	Characterization Activities	Vicarious Activities
OA-08 SV Port Lunar	CA-01 Reflectance Calibration Trending	VA-01 U of AZ/ Railroad Playa
OA-09 SD Yaw Mapping	CA-02 SD SNR Study	VA-02 NOAA/MOBY
OA-10 RVS Cold Space Maneuver	CA-03 Temperature Sensitivity of SD Observations	VA-03 DOE/ARM
OA-14 Cavity Mapping w/Sector Rotation	CA-04 Band 7 SD BRF	VA-04 Oceans Team/Validation Cruises
OA-17 RVS Stability Monitoring via Sector Rotation	CA-05 SDSM Charged Particle Effects	VA-05 U Miami/ In-situ Studies, Commercial Cruise Line
OA-18 SDSM Charged Particle Background	CA-06 SWIR Bands Thermal Leak	VA-06 Ocean Temp Buoy Network
OA-20 SRCA/Diurnal ST Radiometric Stability	CA-07 Establish Space View Moon KOB	VA-07 Antarctica/ RVS

Summary of Validation Activities

(BRIEF DESCRIPTION AT MAY SCIENCE TEAM MTG NOTES)

Operational Activities	Characterization Activities	Vicarious Activities
OA-22 SRCA Spectral Response Stability	CA-08 Optical & Spatial Purity Studies	VA-08 NSF/LTER
OA-23,24 SRCA Co-Registration & IFOV Stability	CA-09 RSB RVS	VA-09 UCSB/ Railroad Playa
OA-26 Thermal Band BB Warmup & Cooldown	CA-10 RSB Destriping	VA-10 U Wisc/HIS
	CA-11 Cloud Edge Transient Response	VA-11 GSFC - Wisc/MAS
	CA-12 Shore Line Transient Response	VA-12 GSFC/ P. Abel
	CA-13 Scene Restoration Studies	VA-13 USGS/ Lunar Radiance
	CA-14 TDI Effectiveness	VA-14 AVHRR

Summary of Validation Activities

(BRIEF DESCRIPTION AT MAY SCIENCE TEAM MTG NOTES)

Operational Activities	Characterization Activities	Vicarious Activities
	CA-15 Bands 31 Cross-talk	VA-15 AATSR
	CA-16 TEB NEdT/SNR Study	VA-16 MISR
	CA-17 Test Sites Trending	VA-17 ASTER
	CA-18 SDSM Screen Signal Ripple & Vignetting Factor	VA-18 GLI
	CA-19 SD Screen Transmission	VA-19 MODIS-PM

Overview of L1B QA Products

- Metadata is divided into 5 types:
  - Core Metadata
    - QG1: Operation Mode--determine from telemetry.
  - Archive Metadata
    - QG2-QG5: Instrument Status Flags
  - Product Metadata
    - QG6-QG12:Product Status Flags
    - QG13-QG19: Granule Level Product Indexes
    - QT1-QT25: TEB QA Products
    - QR1-QR8: RSB QA Products
  - Swath (or Scan Level) Metadata
    - QS1-QS12: Scan Level Instrument Status Flags
  - SDS Metadata (or Pixel Level Metadata)
    - QP1: pixel missing, dead, saturated, or has a calibration failure.

Operational L1B Daily QA Metrics

1) $QA_{RSB} = \dfrac{[\Sigma\, 3\sigma \text{ excedence daily} + \Sigma\,(\text{Physical Parameter out-of-limits daily})]_{\text{current day}}}{[\Sigma\, 3\sigma \text{ excedences daily} + \Sigma\,(\text{Physical Parameters out-of-limits daily})]_{\text{benchmark day}}} - 1$

(Nominally = 0.0)

Totaled for (TBR) Parameters

2) QA_{TEB} Similar to QA_{RSB}

(Nominally = 0.0)

3) $QA_{data} = \sum_{i=1}^{490 \text{ detectors}}$ Bad Data (DN_{-sv}, DN_{-bb} and DN_{-EV}) = 0 or -1

(Nominally = 0.0)

4) $QA_{errors} = \sum_{i=1}^{15} E_i$ (L1B Error Messages)

(Nominally = 0.0)

These summary QA metrics will be provided to MCST daily from the DAAC in a Status Processing Report on L1B; Report may be published on Homepage (TBR)

Calibration Validation Workshops

- **Consensus for calibration changes developed through Workshop interactions**
- **Objective to understand impact of calibration changes to Level 2 products**
- **Test proposed changes with actual data**
- **CAATS used to provide test scenes to L2 developers**
  - Use L2 developers recommended test scenes
- **Project first meeting about 90 days after launch**